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DIVISION OF
OIL, GAS & MINING

JIM
JAN 31 1984

125 E. Center St.
Moab, UT 84532

January 25, 1984

James W. Smith, Jr.
Coordinator of Mined Land Development
Division of Oil, Gas & Mining
4241 State Office Building
Salt Lake City, UT 84114

RE: Final Conditional Approval
S & S Mining Company
Red Rock Mine
ACT/037/050
San Juan County, Utah

Dear Mr. Smith:

In accordance with the conditional approval letter of December 29, 1983 the stipulations regarding the Red Rock Mine have been reviewed.

The Utah State Department of Health advised S & S Mining on December 29, 1983 that at least three (3) feet of freeboard is to be maintained in the new evaporation pond. This recommendation, combined with the 0.5 foot sediment storage level, require the pond to be at least 3.5 feet in depth. A report on the water level in the pond, as well as any future expected wastewater treatment, will be submitted to the Department of Health in December, 1984.

The stipulation regarding the straw bales to control erosion in the topsoil stockpile is fairly evident. However, due to the transitory nature of the ephermal drainage some straw may inadvertently be dispersed in these areas. Every effort will be made to avert this problem. No straw bales will be placed in the natural drainage.

A report concerning the design of the proposed diversion ditch will be delivered within ten (10) days of this letter and, as stipulated, will be based on at least a 10-year, 24-hour storm. A revised map will be included with the report detailing the location of the new evaporation pond and its connection with the emergency overflow ponds, as well as the diversion ditch itself.

The operator has expressed assurance that, weather permitting, the plugging of the drill holes will proceed in the near future, and that the stipulations will be implemented in accordance with the Division's guidelines. If there are any questions or problems regarding this matter, please feel free to contact me at any time.

Cordially,

R. Kim Loveridge

R. Kim Loveridge

RKL: mjb

cc: R.H. Ruggerri

Diversion Ditch Design

S & S Mining Company
Red Rock Mine
ACT/037/050
San Juan County, Utah

Prepared For:

James W. Smith, Jr.
Coordinator of Mined Land Development
Division of Oil, Gas and Mining
State of Utah

Prepared By:

R. Kim Loveridge
Consultant

February 2, 1984

INTRODUCTION

The purpose of this report is to outline the design and sizing procedures for construction of a diversion ditch at the Red Rock Mine pursuant to the Division's stipulations of Registered letter, December 29, 1983. A recommended design will be presented for review by the Division, with the intent of gaining final conditional approval for the operator.

A preexisting map of the mined area was obtained from Mr. Robin Groff, a consultant for the operator, who also provided general background, as well as pertinent drainage information. Soil and runoff data was provided by Mr. Ray Wilson of the Soil Conservation Service and design recommendations were obtained from the Utah State Engineers office.

RAINFALL AND DISCHARGE DETERMINATION

The quantity of runoff resulting from a particular rainfall event was determined using the Rational Method (Haan and Barfield, 1979), recognized by the American Society of Civil Engineers as a simple procedure for estimating peak flow rates in design of small structures. The Rational formula is

$$q = CiA$$

where q is the peak flow rate (cfs), C is a dimensionless coefficient, i is the rainfall intensity (iph) and A the drainage area expressed in acres. A conversion factor of 1.008 to convert acre-inches per hour to cubic feet per second has been neglected. It is important to note that the Rational equation is based on four certain assumptions.

1. The rainfall occurs uniformly over the drainage area.
2. The peak rate of runoff can be reflected by the rainfall intensity averaged over a time period equal to the time of concentration of the drainage area.
3. The time of concentration is the time required for flow to reach the point in question from the hydraulically most remote point in the drainage area.
4. The frequency of runoff is the same as the frequency of the rainfall used in the equation.

The rainfall intensity was determined on the basis of a 25-year, 24-hour storm as recommended by the Soil Conservation Service. This exceeds the design guideline of a 10-year, 24-hour storm as stipulated by the Division. As shown in Figure 1, the amount of rainfall from a storm of this magnitude is nearly 2.5 inches in the geographical location of the Red Rock Mine. The area of contributing drainage was calculated from a preexisting mine map (enclosed),

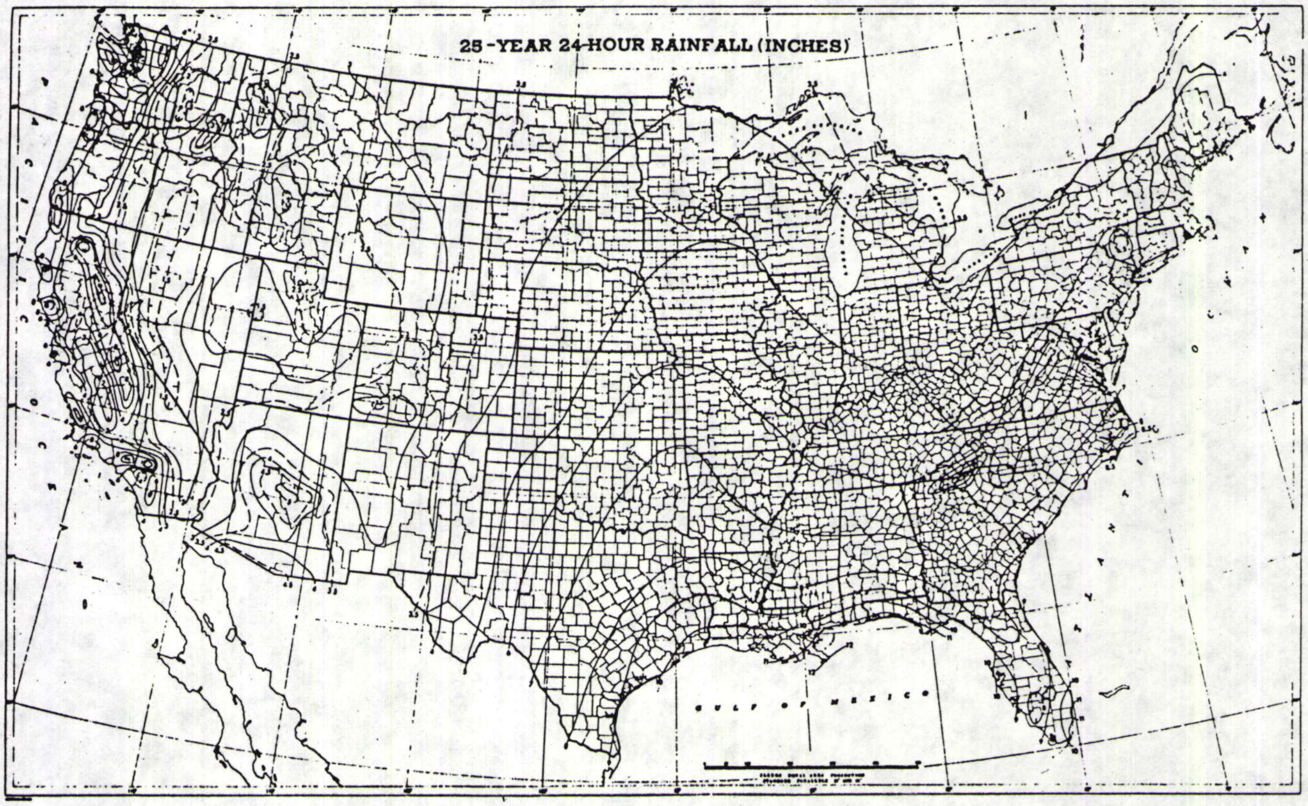


FIGURE 1

Rainfall Amounts by Geographical Region - 25-Year, 24-Hour Storm in addition to local topography sheets. The runoff coefficient was assigned a value of 1.0. This value provides, in effect, that all rainfall occuring on the drainage area will contribute to the peak flow. Table 1 expresses these parameters and the resulting peak flow rate.

TABLE 1

Peak Flow Determination for
Diversion Ditch Design

Drainage Area (Acres)	Rainfall (Inches)	Storm Duration (Hours)	Rainfall Intensity (IPH)	Runoff Coefficient (-)	Peak Flow Rate (CFS)
75.0	2.5	24	0.10	1.0	7.80

Intensity based on time of concentration (t_c), not Rainfall inches (storm precip) divided by storm duration (hours) !!

SIZE DETERMINATION

The proposed diversion ditch is sized according to the limited velocity concept (Haan and Barfield) and utilizing the Manning equation for open channel flow. According to this equation

$$V = \frac{1.486}{n} R^{2/3} S^{1/2}$$

where V is flow velocity (fps), R is the hydraulic radius of the particular channel (ft), S is the friction slope (ft/ft) and n is Manning's roughness coefficient. A maximum permissible velocity of five (5.0) feet per second was assumed for the design under normal conditions.

A triangular cross section was chosen primarily due to the simplicity of construction and economic considerations involved in constructing the ditch. A 2:1 width to height ratio was chosen on advisement from the State Engineers office. 0.5 foot of freeboard is also implemented in the design proposal. Details of the proposed design are illustrated in Figure 2 and the design criteria and ultimate ditch capacity are presented in Table 2. The physical location of the diversion ditch is shown on the enclosed map.

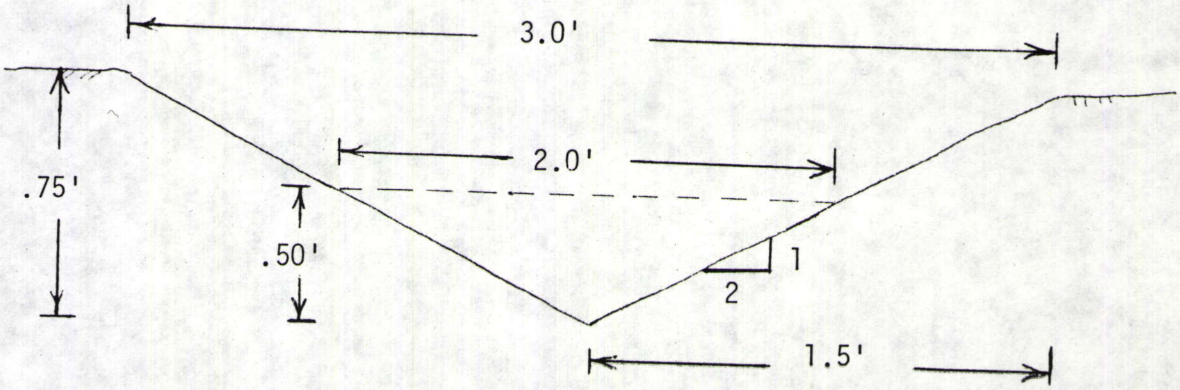
TABLE 2

Design Criteria of
Proposed Diversion Ditch

Channel Slope (ft/ft)	0.08
Manning's Roughness Coefficient	0.022
Hydraulic Radius (ft)	0.134
Permissible Velocity (fps)	5.0
Freeboard (ft)	0.50
Flow Depth (ft)	0.23
Flow Width (ft)	0.93
Total Required Channel Depth (ft)	0.73
Top Width (ft)	2.93

FIGURE 2

Detailed Plan of
Proposed Diversion Ditch



RECLAMATION OF DISTURBED AREA

As stipulated by the Division, the diversion ditch is classified as temporary, and as such, must be reclaimed upon cessation of mining at the site. This section is devoted to outlining a basic plan for reclamation of the area affected by the diversion ditch.

The initial component of the reclamation plan will be to preserve and stockpile the existing topsoil that is removed in constructing the ditch. This topsoil could be placed in a position north of the present topsoil stockpile. The ditch would then be backfilled with this material and graded to conform to the natural slope. Contour ditches six (6) inches deep and spaced on ten (10) feet intervals are recommended to control future sediment migration as well as increase moisture retention.

The revegetation plan, if required, is to seed grasses and forbs that occur naturally in the disturbed area. Table 3 presents some possibilities for this seeding plan.

TABLE 3

Recommended Species for Revegetation

Common Name	Species
Grasses	
Indian ricegrass	Oryzopsis hymenoides
Salina wildrye	Elymus salinus
Forbs	
Big sagebrush	Artemisia tridenta
Rubber rabbitbrush	Chrysothamnus nauseosus

Each grass and forb species selected shall be planted in quantities of approximately 2 pounds per acre. This would result in less than 10 pounds of seed for the entire disturbed area. After seeding, straw shall be crimped and spread over the seeded area.

Revegetation monitoring shall determine if reseeding is necessary and what measures are needed to insure succesful revegetation. A bimonthly monitoring schedule will be maintained during the first year if the revegetation is done in the spring and during the second year also. If reseeding is needed and this is done, the monitoring will be extended an additional year.

All reclamation work, including revegetation, shall be carried out in accordance with the guidelines established by the Utah Division of Oil, Gas and Mining and the Environmental Protection Agency.

CONCLUSION

This report has been prepared in accordance with guidelines established by the Division and satisfactorily addresses the stipulations of final conditional approval required of S & S Mining Company.

Assurances have been recieved from said operator that, upon approval, the construction of the proposed diversion ditch will be performed to specifications implemented in this report, including any further recommendations from the Division thereof.

BIBLIOGRAPHY

Haan, C.T. and Barfield, B.J., 1979. Hydrology and Sedimentology of Surface Mined Lands. Office of Continuing Education and Extension, College of Engineering, University of Kentucky, Lexington, Kentucky 40506.

New-Tech Mining Corporation. Application for Underground Coal Mine Operation Permit, August, 1983.

(I.)

$$q = C\,i\,A$$

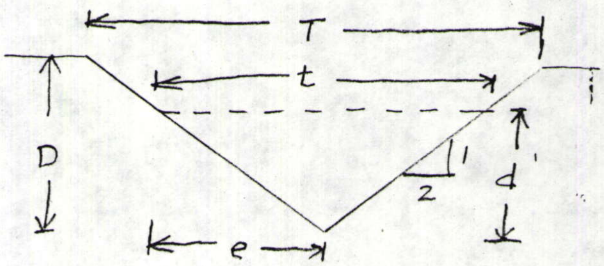
$$q = (1.0)\left(\frac{2.5''}{24\,hr.}\right)(75\,Ac)$$

$$\underline{\underline{q = 7.81\ ft^3/sec.}}$$

(II.)

$$V = \frac{1.486}{n} R^{0.67} S_o^{0.50}$$

$$R = \frac{Zd}{2\sqrt{Z+1}}$$



$$R = \left[\frac{(V_p)(n)}{1.486(S_o)^{1/2}}\right]^{3/2} = \frac{Zd}{2\sqrt{Z+1}} \qquad Z = \frac{e}{d} = 2$$

$$d = \frac{2\sqrt{Z+1}}{Z}\left[\frac{(V_p)(n)}{1.486(S_o)^{1/2}}\right]^{3/2}$$

$$d = \frac{2\sqrt{3}}{2}\left[\frac{(5.0'/s)(0.022)}{1.486(.08\%)^{1/2}}\right]^{3/2}$$

$$\underline{\underline{d = 0.232'}}\ \text{(Flow depth)}$$

$$d_t = d + \text{free board}$$

$$d_t = 0.232' + 0.50'$$

$$\underline{\underline{d_t = 0.732'}} \qquad \text{where } d_t = D$$

$$Z = \frac{e}{d} = 2 \Rightarrow e = 2d_t$$

$$e = 2(0.732')$$

$$\underline{\underline{e = 1.464'}}$$

$$t = 2dZ \qquad D = d_t - d$$

$$t = 2(0.232'')2$$

$$\underline{\underline{t = 0.928''}} \quad \text{(Flow width)}$$

$$T = \frac{D}{d}t$$

$$T = \frac{0.732'}{0.232'}(0.928')$$

$$\underline{\underline{T = 2.928'}} \quad \text{(Top width)}$$

$$Q = VA$$

$$Q = V\left[\tfrac{1}{2}(b)(h)\right] = V\left[\tfrac{1}{2}((2)(1.464)(0.7$$

$$Q = V\left[\tfrac{1}{2}(2e)(D)\right]$$

$$Q = 5.0\,\tfrac{ft}{sec}\left[\tfrac{1}{2}((2)(1.464')(0.732'))\right]$$

MAX. Quantity Ditch can handle $\longrightarrow$ $\underline{\underline{Q = 10.716\ ft^3/sec.}}$